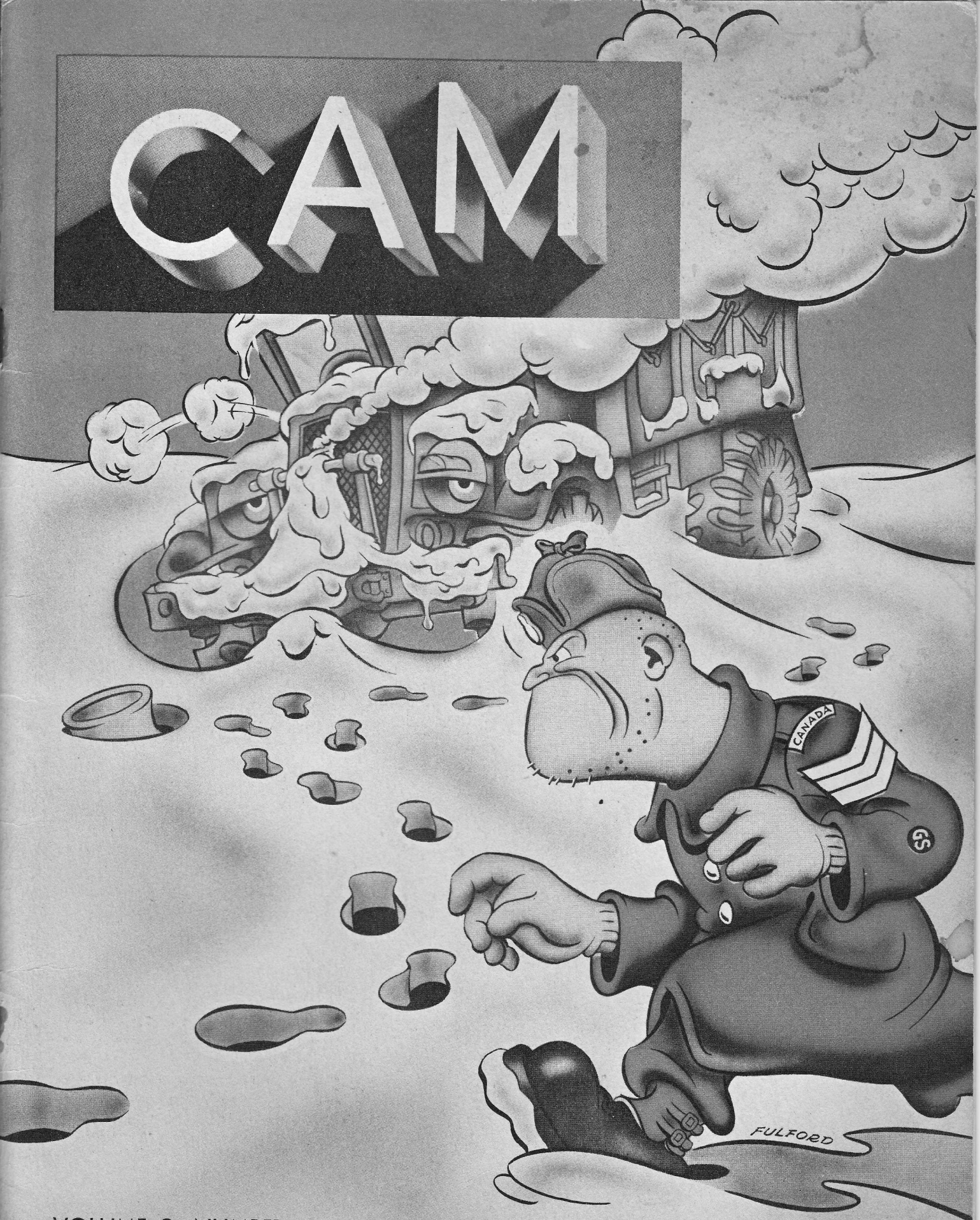
CAM



VOLUME 2 NUMBER 4

JANUARY 1945

PUBLISHED BY THE DIRECTORATE OF MECHANICAL ENGINEERING, N.D.H.Q., OTTAWA, CANADA

EXHAUST

CAM

JANUARY – 1945
VOL. 2 No. 4

IN a world at war, nothing is more natural at the start of a New Year than to look back upon the past months and speculate on the days that lie ahead.

1944 will go down in history as a year of decisive victories for the armies of democracy . . . . a year marked by brilliant landings of our troops in Europe that brought liberation to most of France and Belgium, and renewed hope to millions still held in bondage.

Canadians, fighting courageously on land, sea, and in the air, won new glories for the Dominion. Four V.C.'s within the year went to members of the Canadian army—two of these coveted awards for valour won within the past month!

What of the days ahead? No one can predict with accuracy when and where this war will be won. This we know—hard fighting and heart-rending casualties lie ahead. The Jerry is a stubborn fighter—he's tough and he knows the score.

This new year offers no alternative but serious resolution. It will demand that we make ourselves better craftsmen, better drivers, better mechanics and better soldiers than the enemy. Our guns and equipment must be more than a match for his, for whatever the enemy's fighting standard . . . and it is a high one . . . ours must be higher if we are to beat him.

Let us, therefore, in this new year, determine to put forward both in thought and action our every effort toward the final achievement of victory.

Contents

	Page
Tracta Joint	61
Quick Soldering	65
Respirator Facelets	65
Motorcycle Tire Wear	66
Valve Caps	67
Shock Absorbers	68
Two-Cycle Engine Oil	69
Tune-Up Procedure	70
Body Damage (For B.F.s)	72
Regulators	73
Bicycles	76
Sgt. O'Sweat	77
Benny Boob	78
Generator Model Number	79
Assembly Rack	80
Turret Locks	80
Battery Tools	Inside Back Cover

CAM is published monthly in the interests of Mechanical Maintenance, and directed to the non-commissioned officers and men of the Canadian Army.

Your contributions of articles and ideas are welcome. Address all correspondence to the Editor, CAM, Directorate of Mechanical Engineering, Department of National Defence, Ottawa.

11M-1-45 (5686) K.P. 7020

Figure 2—When your vehicle has a Tracta joint, it should have the axle shaft bushing (right) instead of the oil seal (left).

leak past the seal to seriously lower the level of the lube in the steering knuckle. Some of the boys think this oil seal has something to do with grease getting on the brakes. Now ain't that the most ridiculous thing you ever heard!

There's a good reason for that bronze bushing going in. Back in the days when the Tracta was only a gleam in an English engineer's eye, the ¼-ton had only one thrust-washer to take care of thrust from the Bendix and Rzeppa joints. Then the Tracta came along with a small flange. It went right through the thrust-washer (Figure 2). The engineers got together around a tremendous table and came up with a prescription for this bushing to take the Tracta thrust. Now your quarter-tons have the thrust washer and the axle-shaft bushing.

Vehicles coming off the production lines these days have both of those parts already installed—the washer and the bushing. This simplifies matters when you go to replace the front axle. No matter which joint you put in—the Bendix-Weiss, the Rzeppa, or the Tracta—the thrust is taken care of.

But there are still lots of earlier-

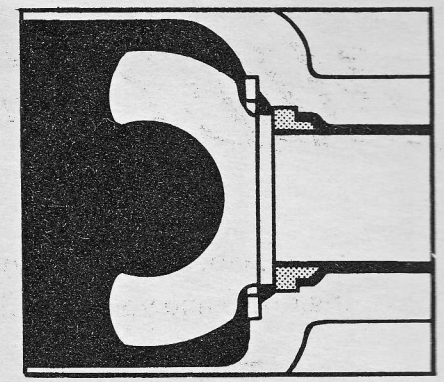
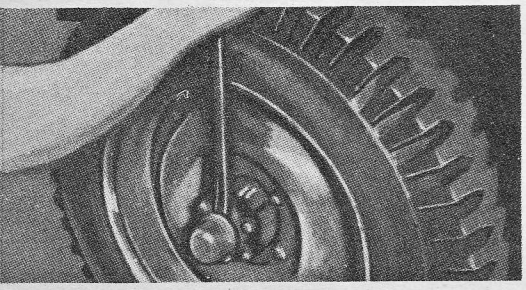
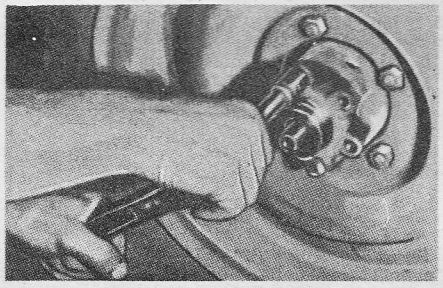


Figure 3—Here's where the axle shaft bushing goes—snug against the housing. The bushing's loose against the axle.

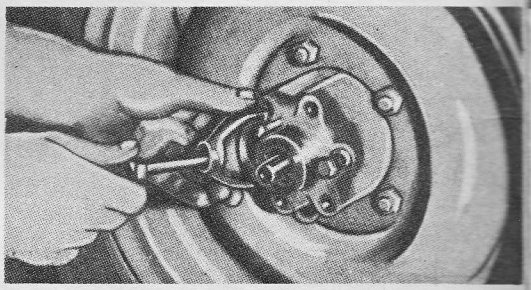
model jeeps running around with the oil seal instead of the bushing in the knuckle. What about those vehicles when you've got a front axle to put in? That depends. If you're putting in a Tracta joint, you remove the oil seal and replace it with the axle-shaft bushing. If you're putting in a Bendix-Weiss or Rzeppa joint,



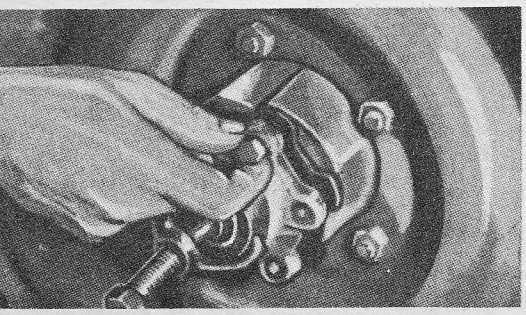
1. Looks to us like he's starting by removing the hub cap. Next the axle-nut cotter pin, and the nut. This photo, like most of the first few, is no doubt duck-soup to you fellows.



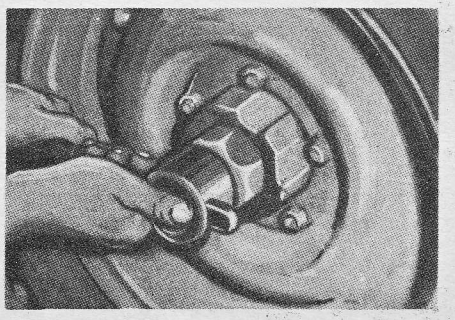
2. Now he's busy on the drive-flange bolts. Leave the last bolt in by about two or three turns. This will keep the flanges from turning when we pull it in the next picture.



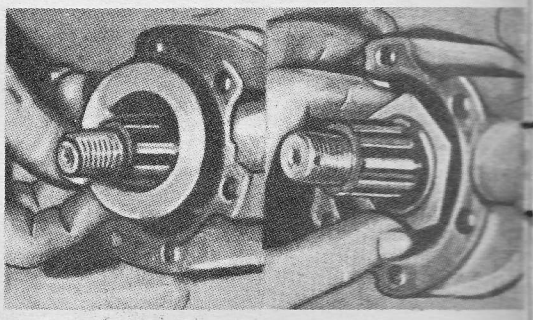
3. He rumaged around among the jeep's tools and came up with this wheel-hub puller. Then like a good mechanic, he put a few drops of oil on the puller bolt before slipping on the tool.



4. Here the drive flange is almost off. Remove the last bolt—thumb and fore-finder, and it's done. It sure was a pleasure to watch somebody else do a nice job.



5. Behind the outside wheel-bearing nut is a lockwasher. He just finished bending the ear on the washer to unlock the nut. The hands are now removing the nut.



6. Out with the lockwasher and wheel-bearing nut. Reassembling: Tighten the inside wheel-bearing nut till there's a slight drag on the bearings when the wheel's turned. Back the nut off 1/6-turn.

6 WIRING

This is a pitfall that many tune-up men fall into. It takes but a few minutes to make voltage drop tests on the vehicle wiring. It's especially important to check the generator and ignition circuits. Resistance in the charging circuit will affect the regulator operation.

Cam Vol. 1 page 188 - Vol. 2 page 14

5 GENERATOR

You can't check the voltage regulator if the generator isn't charging, so you do any work that is necessary to the generator first. Check the brushes —the commutator and the fan belt tension besides finding out if the darn thing will generate.

Cam Vol. 1 page 140 - 145 - 185

4 SPARK PLUGS

You take the plugs out to make the compression test so when you have them out is the logical time to clean, adjust or replace them. The colour of the spark plug insulator can tell you quite a story about the carburetor and ignition if you look at them closely.

Cam Vol. 1 page 48 - 214

3 COMPRESSION TESTS

There's no use overhauling everything else on the vehicle and then find you still have a gutless wonder on you hands. Checking the condition of the rings and valves, etc., should be done with a compression tester or vacuum gauge—before you waste time tuning up a worn-out engine.

Cam Vol. 1 page 36

2 STARTING SYSTEM

If the starting system is sluggish and won't turn the engine over at normal cranking speeds you still can't get a correct compression gauge reading. Now is the time then to check the whole starting circuit and correct any bad connections or starting motor troubles.

Cam Vol. 1 page 86 - 188

1 BATTERY

This is the starting point. With a partly charged battery you can't check the compression satisfactorily, so before you do anything else—make sure the battery is up to snuff. If it isn't, before you go any further you'll have to install one that is.

Cam Vol. 1 page 44 - 53 - 68

TUNE PROC

Come winter, come spri —engines need tune to

IT all started when one, Pte. R. Mortis, stuck his head in our door and asked, "How can I get a tune up." Thinking we were doing the right thing we replied, "A good flushing with gum solvent will do the trick". But how did we know he was going to drink it? When we saw his name in the casualty list we decided to make known the facts on the what, why's and wherefore's of tune up.

Rapidly donning our snowshoes (it looked like it might snow), we rushed over to see a gent by the name of Prof. Phil Harmonic Tootwhistle. We asked him if he would give us a few notes in musician's language on the meaning of the word Tune up. After slowly removing the bazooka from his mouth, and wiping off his chin with his coat sleeve, this is what he told us, "Tune up, as applied to musical instruments, means adjusting them to proper pitch so they will play together in harmony".

Did that mean anything to us? It sure did.

If tuning up musical instruments means adjusting them so they will play together in harmony, why doesn't the same thing apply to engines? It does. Tune up on vehicles means adjusting all the various parts so they will work in unison with one another —resulting in maximum power—pep and economy.

It doesn't mean to give the distributor points a lick with a file, wipe off the outside of the carburetor and take a look at the dash ammeter to see if the generator is charging. It **does** mean a complete check up and adjusting of all parts and accessories that go to make up perfect engine operation.

TUNE-UP AND KEEP

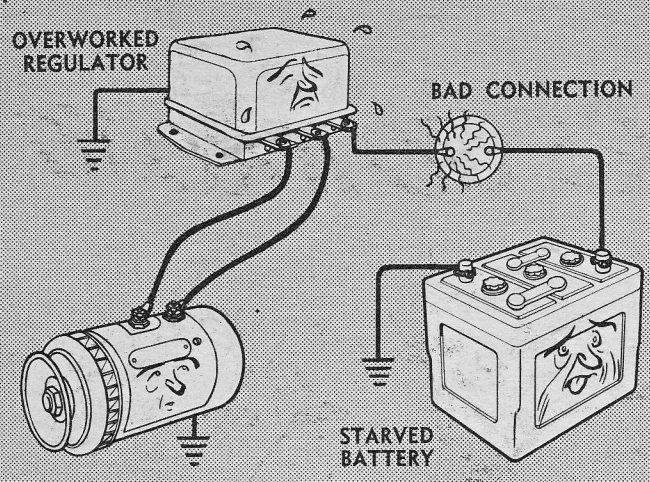


Fig. 2. A poor connection creeps into the picture between regulator and battery. The regulator points take a beating and the battery gets gypped out of charging current.

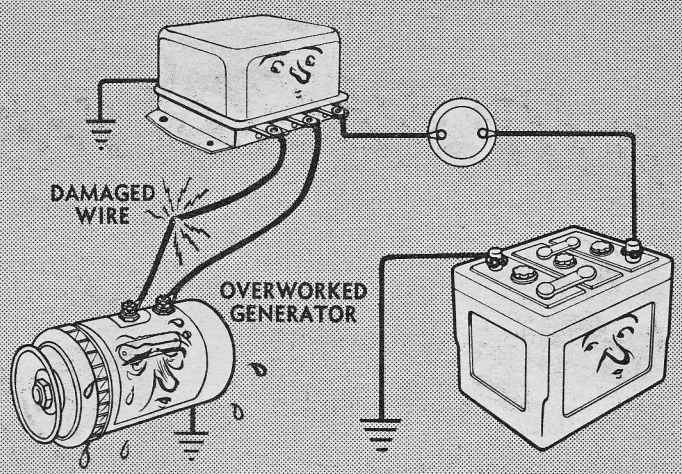


Fig. 3. Resistance between generator and regulator means the generator will take all the rap. Its voltage goes berserk to overcome the bad wire or connection.

charging circuit. (See Fig. 1.) As the battery becomes charged its voltage increases. Therefore the generator voltage must rise, else no charging current would flow into the battery. If it weren't for the voltage regulator, the generator voltage would keep on building up and up, which would result in possible damage to all electrical units on the vehicle. Not that the battery or coil or ignition system will always go up in smoke the moment they get the first shot of high voltage—but their life will be shortened every time they are subjected to a voltage higher than they were designed for. The voltage isn't the actual cause of the burning up of electrical units. The voltage is only pressure, but too high pressure will force too much current through the circuit. It's the current that really puts the "ouch" on electrical parts.

When resistance, in the form of damaged wires or poor connections, sneaks into the circuit, one or more nasty things can happen (Fig. 2 and 3) depending on where the resistance is. If it crops up between the generator and regulator, the generator voltage naturally builds up to overcome the trouble. By the time the current passes the defective part of the circuit and reaches the regulator, the voltage may be normal.

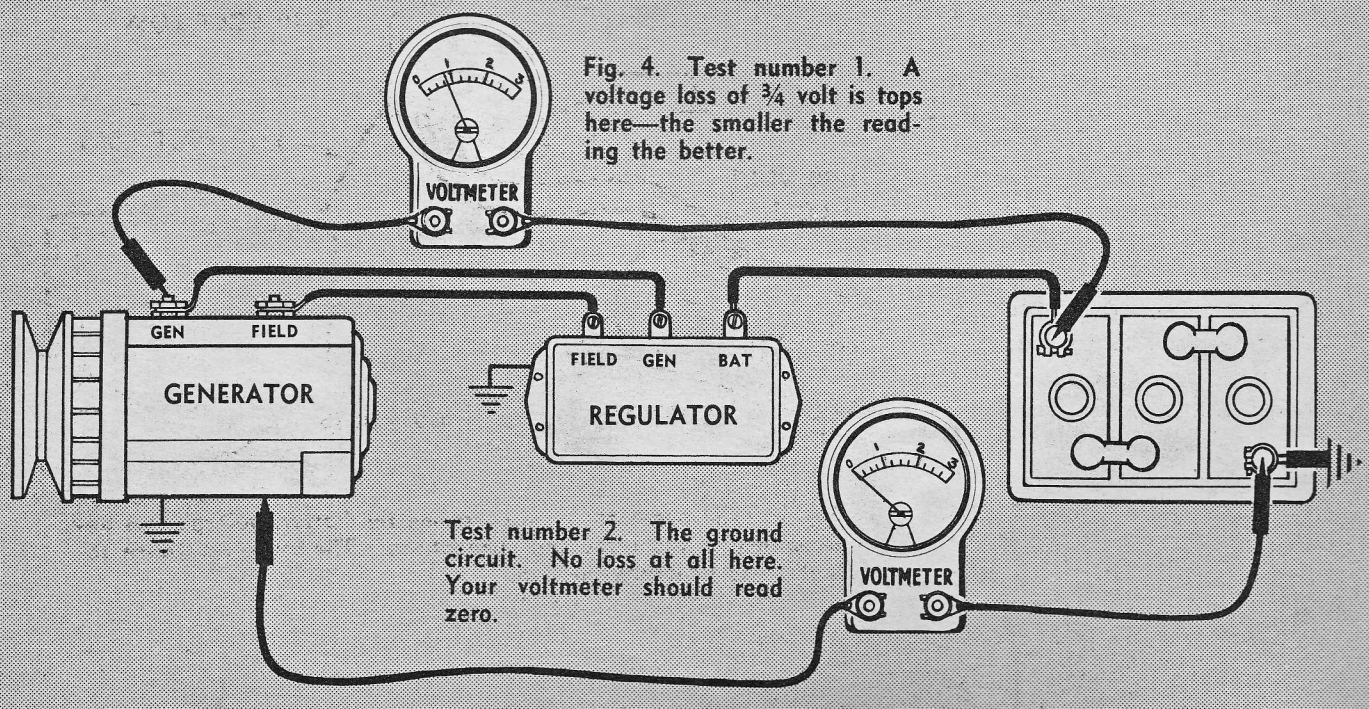


Fig. 4. Test number 1. A voltage loss of ¾ volt is tops here—the smaller the reading the better.

Test number 2. The ground circuit. No loss at all here. Your voltmeter should read zero.

MEET the TRACTA JOINT

Some jeeps have 'em – get the goods on replacing them now and you won't find yourself out on an axle.

Some months ago, one of the editors of the U.S. Army's slick technical magazine "Army Motors" gathered the clearest and most practical story in words and pictures that we've seen on replacing this new fangled joint. We figured you'd like to have this story too.

IT'S new stuff—and because it's new, some of the boys have been getting slight hemorrhages when they've had to remove the joint from the ¼-ton jeep.

When they see the gallstone-shaped hunks of iron come out of the front-steering knuckle—they faint! The boys forget—and think they're working on the Bendix-Weiss or Rzeppa universals. Then, with the joint half out, they look around frantically for those silver balls. But the Tracta, like the fly on the wall, just ain't got any! In fact it's quite different from other front-axle universals.

Case the joints in Figure 1. Those are the three types used in ¼-ton jeeps. All the complicated races, balls, centre pins, cages, and pilots don't mess up the Tracta. It's more like a Chinese Puzzle. It seems tough when you don't have the know-how. When you do, it practically falls apart and together. There's just the two axle shafts—the inner and the outer, and two cleverly designed globs of iron between the shafts. That's all. And the Tracta joint does the same work as the other universals—allows the same degree of turning radius, gives constant velocity speed, and requires the same lubrication. Besides, it's interchangeable. You can wear a Tracta on the right side and a Bendix or Rzeppa on the left and no one will know the difference. *Caution*—each slotted and spigoted half of the Tracta has a matching number—1, 2, 3 or 4. The parts from one joint are interchangeable with another joint *only when the numbers match*.

Whenever you receive a front axle for replacement, if it's a Tracta, look for a bronze bushing dangling along with it. That bushing (Axle-shaft Bushing) goes in, and the neoprene oil seal is yanked out (Figure 2). We've sliced open a steering knuckle to show how the bushing goes in (Figure 3). When it's all set, remember to prick-punch it in about four places to keep the bushing in. Don't feel sorry for the oil seal you took out; it was only a luxury anyway. Any lubricant leaking past that seal couldn't escape far. The inboard oil seal stops the oil before it gets to the differential. In the second place, not enough oil can

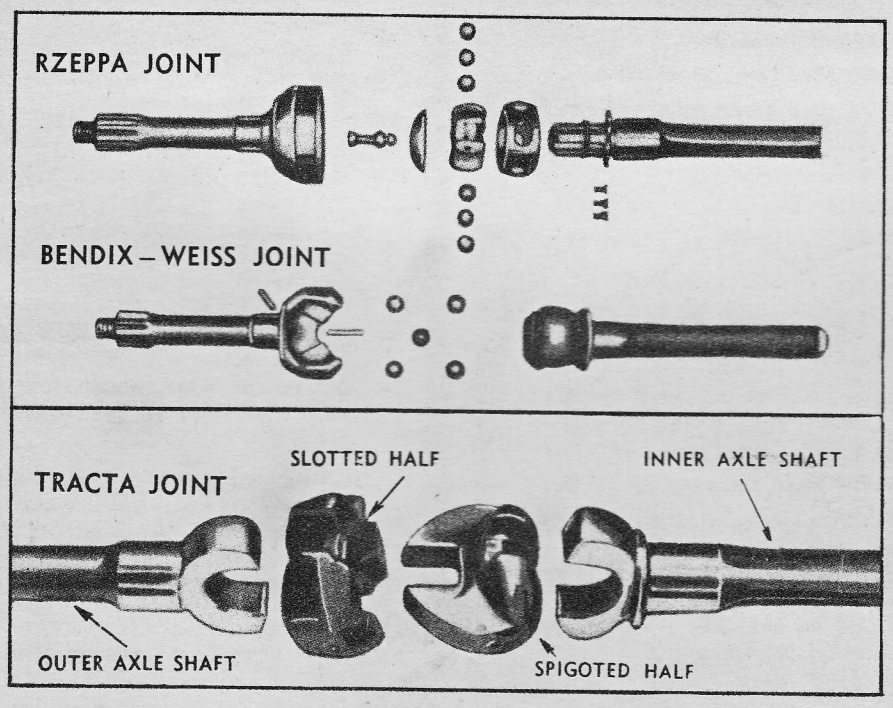
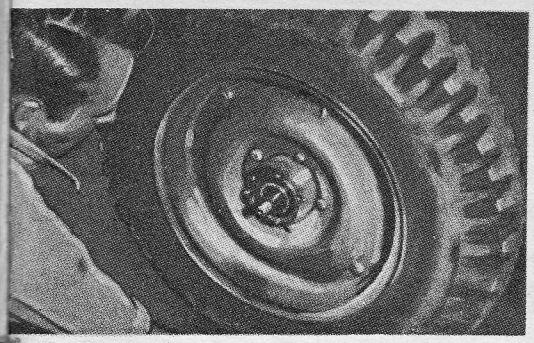
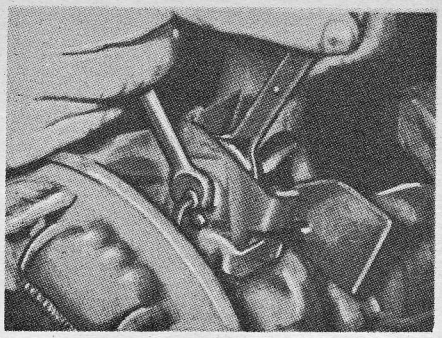


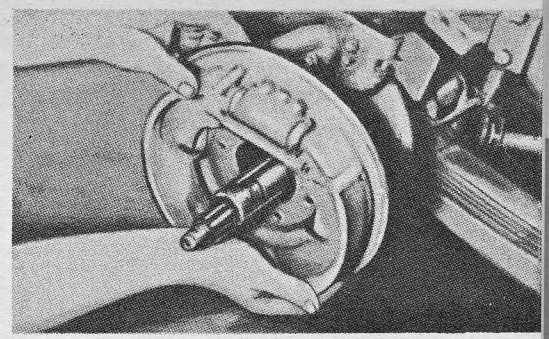
Figure 1—Three of a kind. Learn to know them when you see them. Quarter-ton jeeps may have any of these in the front axle.



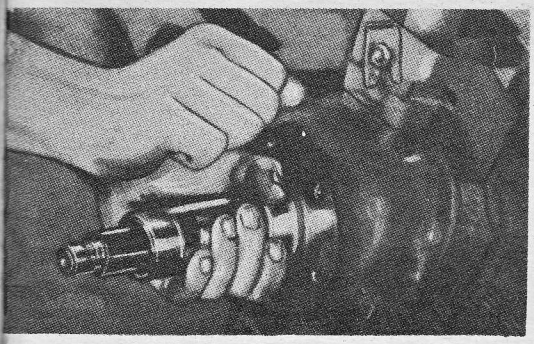
7. Jiggle the wheel lightly to bring the wheel bearing out. Watch it—don't drop the bearing on the ground. Dirt and bits of junk don't mix well with bearings. Now take the wheel off.



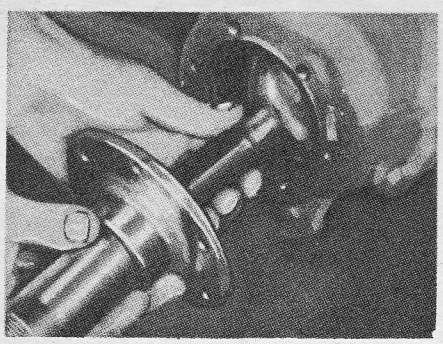
8. Disconnect the brake tubing. That wrench in the back is the one to watch. He's holding the inside nut. If he doesn't he'll twist and break the tubing when he tries to remove the outside nut.



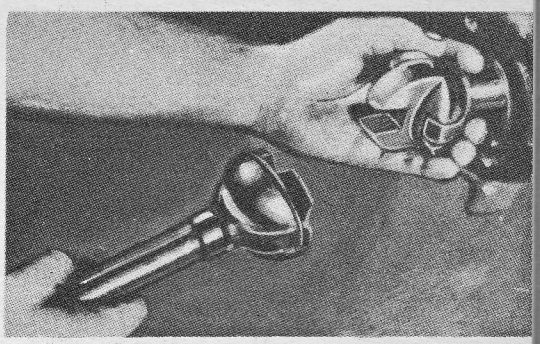
9. While we weren't looking, he removed all the brake-backing-plate screws. The brake backing-plate comes off easy now. And he's all ready to start work on the spindle.



10. Watch how he breaks the spindle loose from the knuckle. It takes a little technique. Wrap one hand around the spindle to support it. Give the spindle a hefty sock with the fleshy part of the hand, enough to "break" it free.



11. Ah-ha, he changed hands. The idea is to reach in and grab the outer axle shaft. If you don't hold on to the axle, it may come tumbling out with half of the Tracta, right into the sand. Now remove the spindle.



12. There's the complete Tracta joint—unmasked. The outer axle shaft he's holding has the slotted end of the joint still on it. The inner axle and the spigoted half of the Tracta are about to be pulled out of the knuckle.

you leave in the oil seal. Just straighten the seal out if it's a little battered. It's still needed as an axle centering guide. But don't let anyone catch you grounding a jeep just because that seal's slightly egg-headed, or chewed up, or even missing!

Now we'll peel open the front end for you. They've just rolled in the silver-plated ¼-ton. Wait till I roll up the sleeves of my fatigues and get comfortable—I want to watch this mechanic do his stuff.

Putting In The Tracta Joint.....

is just a matter of back-tracking through the steps we've just showed you. Before you start, better get down and squint at the inside of the steering knuckle. See if the bronze axle-shaft bushing is in there (Figures 2 and 3). If not, you'll have to put one in.

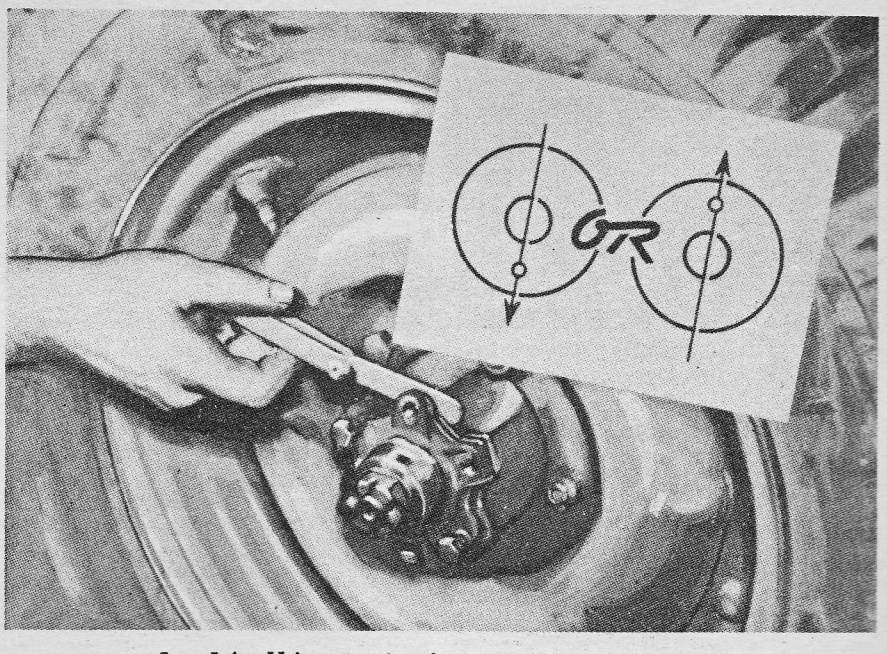
Next, put in the Tracta. Follow either Step 12 or Figure 1 when you put the Tracta joint together and you won't go wrong. Just remember that the spigoted half fits on the inner axle and faces toward the wheel. Next, bolt the wheel-bearing spindle in place (Step 11), and keep following the steps back through 5. When you finish all those steps, meet me here.

Let's see now—you've assembled everything, down to the axle flange. Before tightening the rest of the axle in place, you've got to check the clearance in the Tracta. Right here some yardbird mechanics get lazy. They don't see why that checking business is necessary. 'Course if you always drove with the wheels straight ahead, you wouldn't have to be so particular with play in the Tracta. Because in the straight ahead position, the joint just revolves. There's more action, though, when you turn the wheel. Those slotted and spigoted halves are brought closer together on one side all during the time they're revolving.

Unless they have enough room to move more freely, the Tracta is apt to grind itself into a fine powder—much quicker than it takes to adjust the joint.

You adjust the clearance in the Tracta by putting the shim pack between the axle hub and drive flange. More shims there means

more clearance between the halves of the joint. The test is to find how much of a shim pack is needed. It varies with each vehicle. First, cramp the wheels full left (or right) against the turning-radius stop. Put on the drive flange WITHOUT SHIMS. Two drive-flange bolts screwed in loose-like, by hand (Step 5A), hold the flange on snug. Tighten the axle the axle-shaft nut. Revolve the wheel enough to bring the punch mark on the axle end to a top or bottom centre position. Measure the distance between the drive flange and the hub—the way he's doing in Step 5A. This gauge happened to show .010". The maintenance manual says to put in .015" to .035" shims in addition to the reading you got between the drive flange and the hub. That's the shim pack you need to give your Tracta clearance enough for all turns. His first reading was .010", so he put in a .010" shim, and then a .020" shim in addition. (As I wet my thumb to turn a page in the manual, I noticed this: "If no clearance is had between the drive flange and the hub, install a .010" shim.") Go ahead and put back the drive flange with the right amount of shim pack and all the drive-flange bolts, the axle shaft nut washer, and nut. Draw everything up tight. Wipe your hands on a greasy rag and you've put in a new Tracta joint — **ALMOST**. Almost except for a final check.



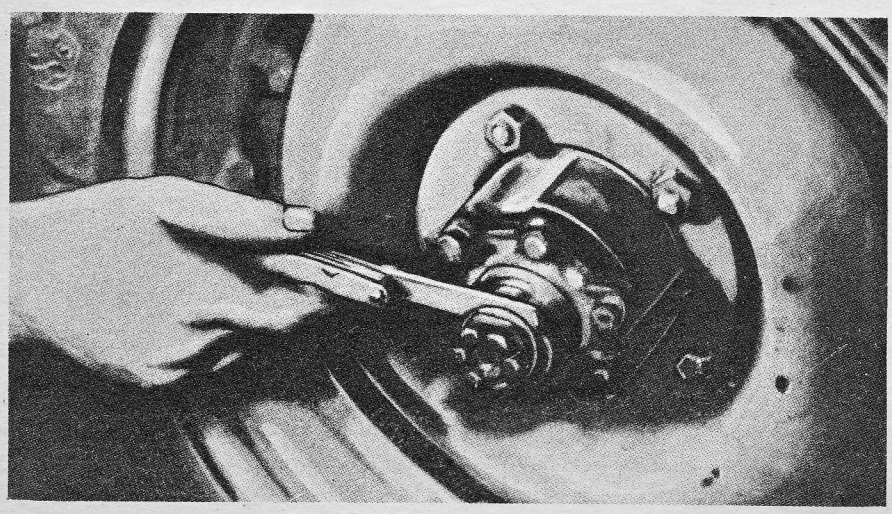
Step 5A—He's measuring the distance between the flange and the hub. (Inset shows correct position for punch mark on axle, when doing the measuring.)

Like all good mechanics, the fellow who loaned me his hands for these pix-chewers is a careful guy. There's a chance to make a few slip-ups when he made the first adjustment. So he made an extra check to keep from having nightmares of the Tracta wearing itself down to two stumps. Back off the axle-shaft nut till your feeler gauge shows .050" between the nut and the flange. Then tap one the end of the axle with a hammer. Don't hit the hammer directly against the axle—put a block of wood against the axle and hit the wood. A few taps and you'll feel the axle jump in. Measure how much space is now left between the nut and the flange. (That's what is going on in Step 5B.) If the measurement's anywheres between .015" and .035", you can throw out your chest. You've put in the shim pack that allows enough play in the Tracta. And, that's a good job. Tighten the axle-shaft nut again, install the cotter pin, and put back the hub cap.

Don't muck up your job now by forgetting these important odds and ends: bleed the brakes, fill the steering knuckle with lube (up to the filler plug), and check the toe-in of your front wheels.

x y z

Step 5B—The double check. Before this shot was snapped, he had backed the nut off and tapped the end of the shaft. The gauge will show if he's done a good job of installing the axle.



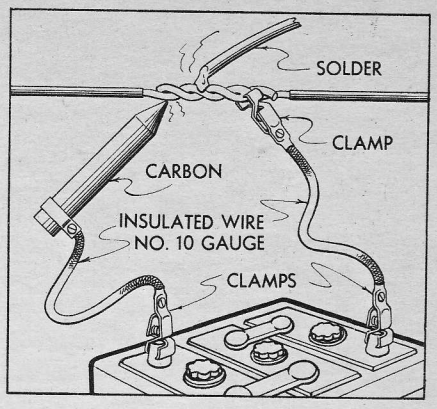
QUICK SOLDERING

HAVING to spend half an hour to solder one teensie-weensie little connection is down-right exasperating. The actual soldering only takes about a minute. Getting the iron ready is what takes the time. Chances are you'll have to fill the blow-torch, then dress up the soldering iron before you even get started. In other words, it's no wonder temptation often wins and you leave the new terminal or spliced wire unsoldered — knowing full well that somebody is going to develop a severe headache trying to locate the trouble when looseness and corrosion sets in.

You don't have to make such a fuss over each little soldering job. If you want you can solder without an iron or a torch. All you do is saw a standard size flashlight battery in half and take out the carbon rod. A six volt battery, two pieces of fairly heavy insulated wire, three battery clips and the carbon rod is all you need. Grind one end of the carbon rod to a dull point, attach one of the wires to the opposite end with a clamp, and you'll be ready to do a soldering job anytime in jig time. Just make the connections like the picture shows.

The battery in the vehicle can be used if you haven't another one at your elbow. If you use the vehicle bottery, however, disconnect the battery cables so you won't cause damage to the vehicle wiring by a short circuit.

When you touch the part to be



soldered with the carbon rod, the parts will be heated sufficiently to melt the solder. You'll still have to observe the simple rules of cleaning and using a *rosin* core solder, but think of the time you can save if you don't have to worry your curly cranium about getting an iron hot!

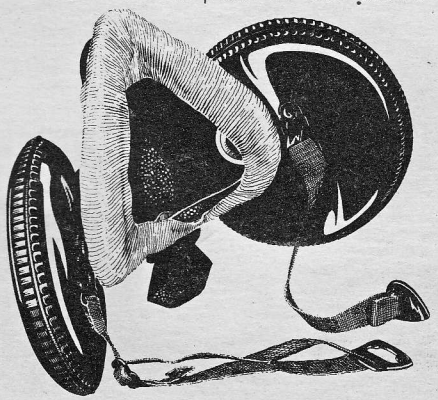
x y z

SCHNOZZLE GASKETS for PAINTERS

BELIEVE it or not, the olive drab life of the spray-gun wizard won't be so dull in the future. Not long ago a new type respirator was issued to these squirt gun handlers for the asking. Everything was jake —the new "Comfo" respirator seemed to have everything. It was light, it was efficient and it was comfortable. Then it happened. A corporal by the name of Wash— burned up when he unintentionally found a new way to have his face lifted.

The corporal, being a hard worker, had been happily squirting his gun all over the shop. He was happy because he knew that with his new respirator in place he was safe from inhaling the poisonous lead fumes. The job completed, the artist proceeded to remove the respirator, and to his mortification— part of his face came with it. Some of the paint spray had settled around the edges of the respirator and had dried—sticking the face piece to his skin.

The army medicals, being aware of the fact that the paint shop isn't the best place in the world to practice plastic surgery, came to the rescue with "facelets". A facelet is not a baby face. It is a small doily made of knitted cotton. It fits on the face-piece of the Comfo



respirator, thus preventing the rubber from contacting the user's tender hide. In other words they make the new Comfo respirator more comfy.

You can take them or leave them —they're not compulsory. However, you'll be damn glad to get this little facelet to protect that handsome countenance your parents gave you.

The facelets (Part No. D.N.D. 90821) can be obtained from your Spare Parts Depot in the usual manner. When you use them—use your head. Make sure they fit properly between you and the respirator. These little face frocks aren't expensive, neither are they free, so don't waste them.

When they get dirty, don't toss them out, join the doily dippers and dunk them in your favourite soap suds (the kind that 9 out of 5 stars use) to make them good as new.

x y z

M'CYCLE TIRE WEAR

"LONG time no see," says Sgt. Hutch to Staff Sgt. Cranberry one bright day as the Staff rolls his solo up to the M/C shop door. "Where y'been, got a cigarette, and that's nice looking rubber you've got on your bike!"

"All over the country, help yourself and those tires are the originals that this bus was born with," replies the Staff.

'They sure look in good shape for that mileage," says Hutch, glancing at the mileage recorded on the Staff's speedo. "Reason I mentioned it is that we've got some jobs in here with all sorts of kewpeelia wear on the treads, and only half that number of miles under their belts—been wondering what's causing it but haven't got round to doping it out—got a match?"

"Zatso?" murmurs Staff Cranberry. "Well, I happen to be a particularly fussy buzzard when it comes to tires on m'cycles and have devoted a goodly percentage of my valuable time rubbing noses with these underdogs—getting wise to their ways and wear."

"Take," continues the Staff, "that front tire I see draped on the leading wheel of Number 7 over there."

"Yeah" puts in Sgt. Hutch "that's one of the tires I was mentioning—worn most peculiar."

"I would say" says the Staff—assuming a tone which he figured was a good imitation of Sherlock Holmes. "That Number 7 has been used a considerable amount on hard surfaced highways at fairly good speed".

"Amazing—pray tell, how do you know?" says Hutch—entering into the spirit of the thing.

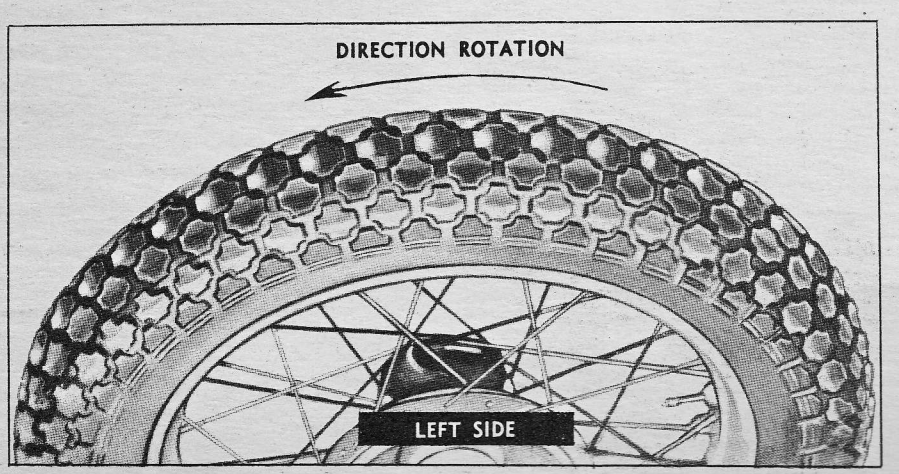
"Alimentry, my dear fatso" murmurs Staff. "A quick glance shows me as neat a case of "heal and toe wear" as I've laid a blinker on. Look at those knobs in the centre bead of the tread—note how they're worn more on the **trailing edge** of each knob—sorta cup-like. I can think of two or three things that can drum up a condition like this. First, —wear due to front wheel braking which scuffs off the rear end of each knob. That's not saying that you shouldn't use the front wheel brake. It should be used along with the rear brake for safer and surer stopping. Anyhow, lookin' at Number Seven's front tire it's easy to see that it's more than just the action of the front brake that's causing the odd wear".

"Do tell" murmers Hutch.

"Yep—let's see that ride control. Mmmmmmm, very loose adjustment and that means more scuffing. How come? Well, you're toolin' along, see, and the front wheel hits a bump, the forks go way up—then come way down—and **keep** bouncing because there's no damping effect. This wheel-bounce causes scuffing as the tire keeps making 'spot contact' with the ground. Also the lengthening and shortening of the wheel-base that occurs with this loose fork action adds its bit to the scuffing programme. On the other hand, a damper that's wound up too tight will give you the same bad effect. The fork action is hardly functioning at all and the bike will 'hop' or 'buck' in the road. Anything that tends to make the wheel leave the road does its bit towards scuffing."

"O.K." says Sgt. Hutch "Number 7 can be classed as a bad case of scuff—but what about this baby over here? Here's a tire that seems to be worn a lot more on the left side than on the right."

"Ah" cries the Staff, "I've met these jokers before, too. What side



This is a scuffy. Heel and toe wear looks like this in the flesh. Note the cupped effect—with excessive wear on the trailing edge.

of the road do you ride on?"

"Right" says Hutch brightly.

"Right—and as roads are crowned, the machine naturally rides higher on the left tread of the tire—it's going to wear that side more than the other. Right?"

"Right," says Hutch.

"Now," goes on the Staff, "which way do you usually turn your machine around? To the left, isn't it. Because I suppose, the foot brake is on the right side and the jiffy stand on the left."

"Right," says Hutch.

"And another thing—y'ever notice how the bike has a tendency to steer or 'pull' slightly to the right?"

"Ri....."

"O.K.! So the natural tendency is to lean the body to the left or sit over on the left of the saddle to compensate—and keep the machine going straight down the road. Add all those things together and is it any wonder the left tread of the tire shows more wear."

"That's all dine and fandy" says Hutch, "but look at the tire on your bike—it don't look like either of these. It's the same model bike—what's it got that mine hasn't?"

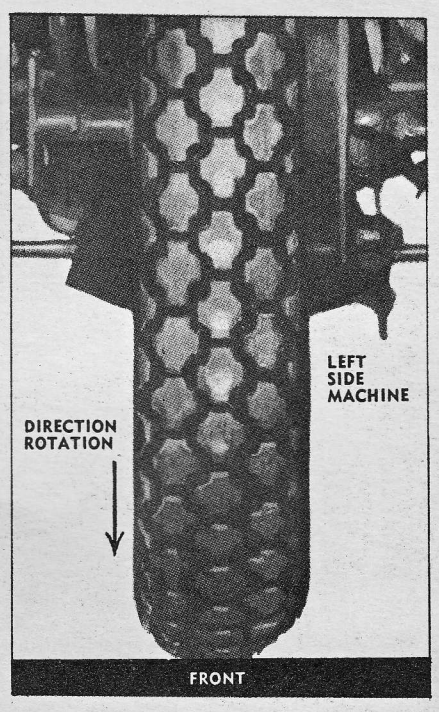
"Me," says the Staff, with admirable modesty.

"Y'see," he goes on, "there are balancing factors to all this monkey business. One of them is the interchangeability of the wheels on this particular model. By changing wheels from front to rear, the left side is changed to the right and the direction of rotation is also reversed. And you don't do this every second birthday or just on leap years but every 2000 miles. It's a very simple job and much easier than changing the front tire around. Doing it at short intervals doesn't let the 'knobbing' or 'slope' get too far advanced."

"Also—the ride control should be **used** to dampen the bounce from the front wheel—thereby cutting out two of the causes of scuffing. And last but not least—**watch the tire pressures.** Underinflation accelerates all this wear. On this angle there's a little gimmick that's not rated very important by the average Cyclist—the **valve cap**. These little valve stem derbys do more than just keep dirt and fluff out of the valve—they help keep the air in. A m'cycle tire, even under normal operating conditions, does a lot more bouncing than the average vehicle and this pounding will squirt little bits of air out through a tire valve. The cap is what stops it and holds the pressure.

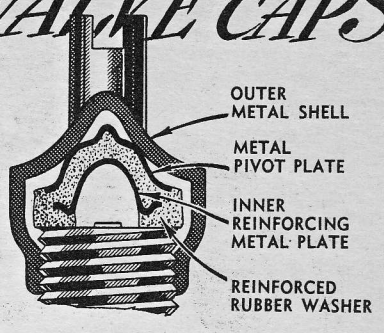
"So there you have it" says the Staff, kicking over his motor. "It's all up to the joe keeping the saddle warm to see that his rubber doesn't get into those strange wear provoking shapes. Beseeinya!"

"Love dat man" murmered Hutch.



This is a lefty. The left side of the tread, showing more wear than the right, points to a tire switch as an obvious cure.

VALVE CAPS



LOCATE yourself a group of vehicles. Assume a bent posture, calculated to bring your nose level with their tire valves and start counting the valves that are minus their valve caps. Before you get to one thousand—quit. You'll have got the point by then that there's a whole flock of tire valves going around bareheaded in this man's army.

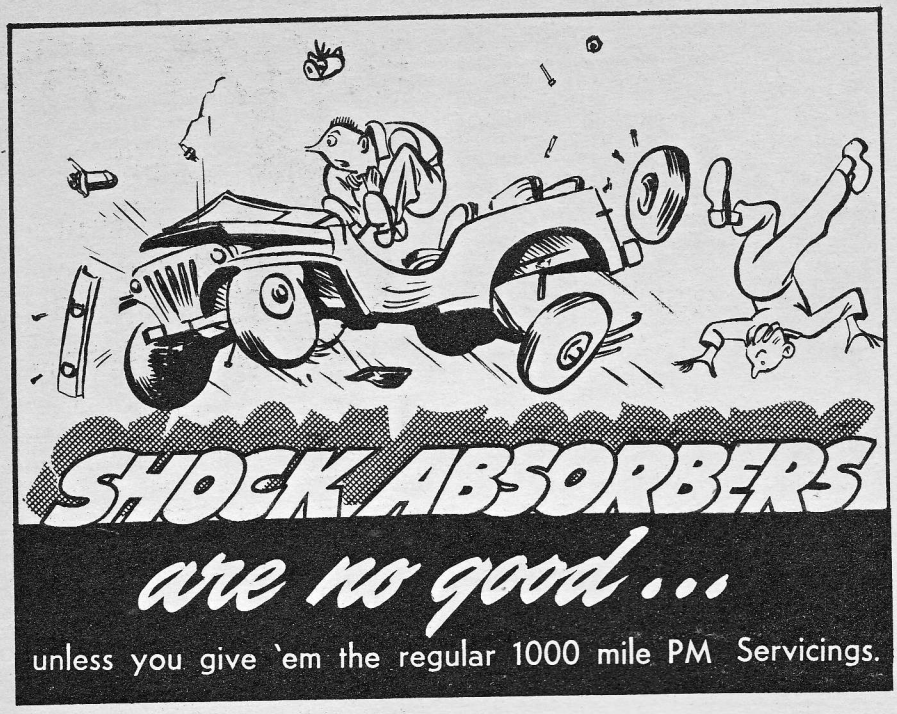
Correct inflation pressure is more than half the battle for rubber conservation—that's what makes the tire valve assembly so dad-ratted important. Neglect it and you get slow leaks, under-inflation and tire destruction following each other in close succession.

The cap's job is to keep dirt out and air in. Get that last bit—*keep air in*—because lots of people traipsin' around in trucks don't realize that a valve cap, tightly screwed down by hand, is capable of holding up to 250 pounds of air pressure on its own hook.

So see that there's one of these caps on **every** tire of your vehicle. If you have a habit of losing track of them during tire checks, do what some outfits have done: daub a bit of red paint on the outside of the cap so that they stick out like the sarge's nose at a temperance meeting. That way they stand a better chance of being picked up and replaced—and they also become **more** conspicuous if absent.

Remember—flat tires and flat beer both can come from the same foolishness—leaving the caps off.

X Y Z



SKIPPING the job of servicing shock absorbers is the easiest thing in the world. All you've got to do is make a pass at it with a rag, or, if you're the conscientious type, you can say "Hell, that's a workshop job! Let those guys take care of them!" But no matter which method you use, it's going to cause you more work in the end.

As any mechanic knows, properly serviced shock absorbers mean longer periods between broken springs and also better steering control of the vehicle. The double-acting type shock absorbers (used on most of our vehicles) keeps a large part of the force created by a bump from ever reaching the spring. It also prevents excessive rebound after the vehicle spring has been compressed by a bump. So if you'd rather be a mule and look the other way when it comes to giving shock absorbers their 1000-mile servicing, you can look forward to sweating it out changing springs, changing worn-out shock absorbers and listening to the drivers gripe about the lousy way their trucks steer.

There are two types of shock absorbers used on Army vehicles: Direct-Acting and Double-Acting (see illustrations).

Unit Garages can forget about the direct-acting type (used on jeeps and some passenger cars) because servicing and overhauling these is not a unit job. They are either sealed by the manufacturer or require specific amounts of fluid and must be referred to higher echelons. Of course you can do a Unit Replacement' on them in Unit Garages.

But servicing the double-acting type shock absorber is definitely a

Fig. 1—Direct-acting type shock absorber. Servicing this type is not a unit job, so don't try it.

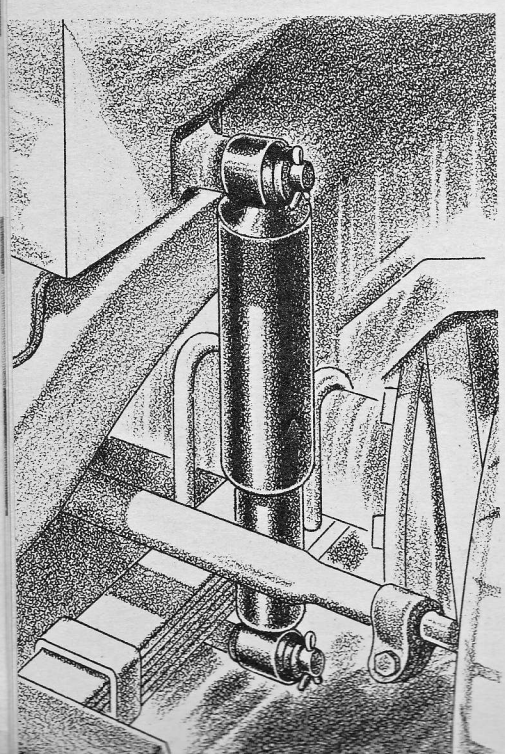


Fig. 2 — Double-acting (Houdaille). Service this.

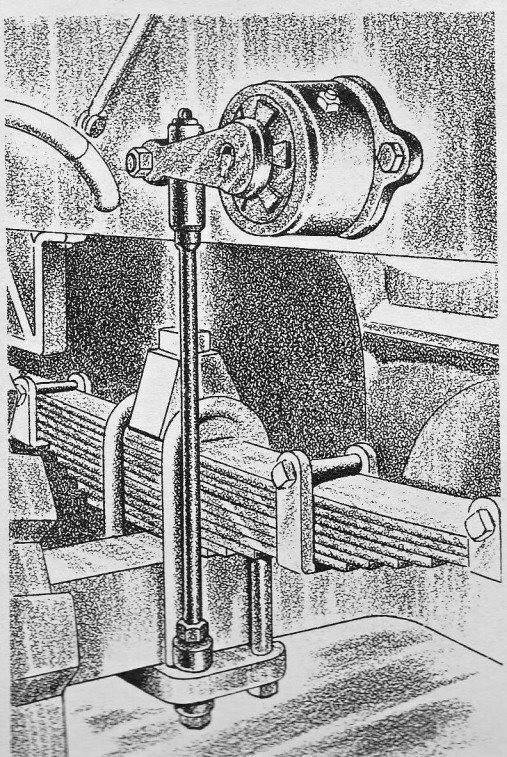
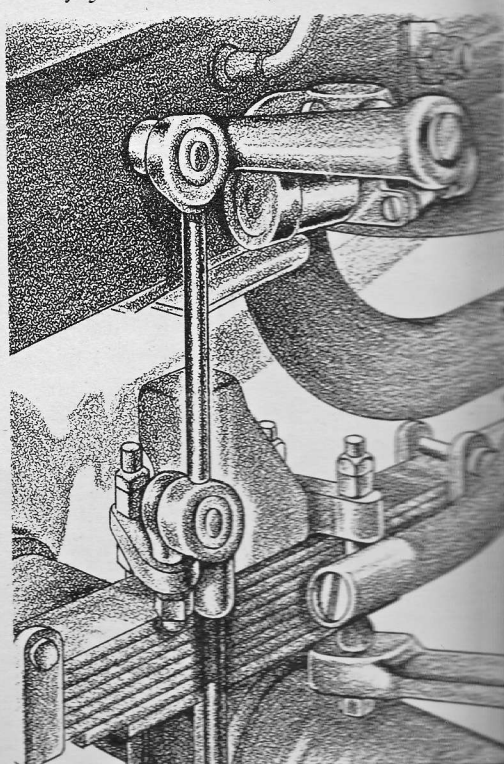


Fig. 3 — Double-acting Delco-Lovejoy. Service this, too!



Unit Garage job. And in case you're a little hazy about what the 1000-mile services consist, of we've listed them below.

Inspect shock absorbers for fluid leaks. Fluid seepage on the shock absorber body and arm indicates a leak. Take them off and install new ones. Taking them apart is a Workshop operation.

Test the bolts that hold the shock absorber to the frame for tightness. Put a wrench on the bolts and pull them up. A loose shock absorber will give you plenty of headaches.

Test shock absorber linkage for wear. Work the top of the arm up and down. Then watch the joints in the linkage for lost motion. If the linkage is excessively worn, yank them off and install new ones.

Fill shock absorber with fluid. (Now, don't get excited—this job isn't as bad as it's cracked up to be). To fill a shock absorber, disconnect the shock absorber link at the axle housing. Wipe all dirt away from the shock absorber filler plug, remove the plug, and fill the shock absorber body until fluid flows from the filler hole. Work the shock absorber arm up and down several times. This allows air trapped in the shock absorber cylinder to find its way out. If air comes out, the level of the fluid will drop down. Refill the shock absorber. Repeat the operation of working the arm and then refilling until the fluid remains level at the filler hole. Replace the filler plug and test the action of the shock absorber by working the arm up and down. The resistance on the compression stroke (pushing arm up) should be greater than on the rebound stroke (pushing arm down).

The number of springs broken in your outfit depends on you. If you service the shock absorbers faithfully every 1000 miles, you'll have less springs to replace and hear less griping about bad steering vehicles.

x y z

Two-Cycles are Different

THAT'S what the man said—that's what he said—the man said—two-cycle engines are different and that's why there's liable to be a bit of trouble.

O.K.—so two-cycles are different! That we already know. We know that the oil is mixed with the gas f'rinstance, and goes through the crankcase as a mixture and up into the combustion chamber the same way. The oil in the mixture lubes the working parts and the gas in the mixture provides the 'go'—not like the normal four-cycle engine where the gas has its own private entrance, and the oil gets around on its own.

But where's the trouble?

Well, the whole thing was explained to us by Herkimer G. Wells (a big oil man), the other day when he slipped in our office (the floors had just been waxed).

"You recall", he said, making himself comfortable on the floor, "about a year or so ago the Army started using special H.D. oil. This oil contained additives that do a lot of good things for your engine—cut down sludge formation, keep oil lines free and generally help to keep things sweet and wholesome in the crankcase."

"Quite, quite", we agreed "Everything in the crankcase is lovely".

"Then came this two cycle business", goes on H.G.—an oily tear springing to his eye. "And trouble. It was noticed that two cycle engines were getting difficult or impossible to start. Upon removal of the spark plug, it was found to be fouled by a metallic oxide deposit. Even by slipping a new plug in and starting the motor again it would sometimes run for only a very short period and then quit. Examination of the head (the engine's—not the operator's) showed a similar heavy ash formation."

"Who dunnit?" we asked with bated breath.

"After a lot of research and testing", he went on, ignoring our question, "it was found that some sort of a chemical action was taking place between the gas and the oil—or more specifically the lead content of the gas and the detergent additive in the oil. This had the effect of rapidly fouling the combustion chamber, piston head and plug of any two-cycle engine. A regular four-cycle engine isn't bothered a bit in this regard and the detergent element in the oil goes about its job in first-class fashion—just these two-cycle engines—because they're different, are out on a limb."

"So what do we do with these two-strokes?"

"We use straight mineral oil for mixing with the gasoline," says H. G., sliding himself across the floor towards the door. "Use D.N.D. 65A—which is available from Ordnance stores and your two-cycle engines will run as sweetly as a four-cycle does on H.D. Don't forget that proper mixing is still as important as ever. Get a suitable clean container, with a lid, that will hold at least a gallon more fuel than the quantity you're going to mix. This saves you from slopping all over. Pour the gas in first—then add the D.N.D. 65A oil—in a ratio of ½ pint of oil per gallon of gas. Shake well for about three or four minutes—in cold weather longer—and serve through a fine mesh strainer."

"Should be a good party" we said, as H.G. wormed his way out into the hall and down the stairs on his stomach.

x y z

7 GENERATOR REGULATOR

Operation of the cut-out relay, voltage regulator and current regulator must be checked with a test ammeter and test voltmeter. Skipping this part of the tune up is like starving Fido the Watch Dog—when you need him he's too weak to work. P.S.—You don't have to remove the regulator cover to give it a check.

Cam Vol 2 page 5

8 IGNITION SYSTEM

In every case you should check the condenser, the contact spring tension and the spark advance mechanism. Don't pass up the distributor cap either unless you want a comeback. The coil is a very important part of the ignition system and unless you have X-ray eyes you can't tell if it's good or bad by merely looking at it. Then of course, there's the high tension wires, if they're cracked or corroded—well—need we say more?

Cam Vol. 1 page 177 - 188 - 214
Vol. 2 page 26 - 41

-UP
EDURE

ing, come summer or fall
keep on the ball.

9 IGNITION TIMING

This should be adjusted to manufacture's specifications before the carburetor is checked. Extreme care should be taken when making this adjustment—it's like the finishing coat of a paint job, it's the final operation in adjusting all component parts to work in unison.

10 FUEL PUMP AND LINES

Checking the pump should be done before you check the carburetor. If the pump pressure is too high or too low it may throw you when you try to get a line on the carburetor operation.

Cam Vol. 1 page 166 - 195

There's no use doing a carburetor overhaul if the valves and rings are bad. It's a waste of time installing new distributor points without checking the voltage regulator. It's also a waste of time installing a new battery without making sure the generator and charging circuit is in good condition. Tune up, then, means a thorough job, an all-out effort to synchronize all correlated parts and units. Skipping one unit or one part may gum up the whole works.

Having that question settled firmly under our hair we wondered just where a really hep tuner-upper would start on a vehicle. Would he start with the distributor—the carburetor—the compression, or the battery? Two whole minutes of checking showed us that different people had different ideas on the starting point but we did find out that they all had something in common. Each followed a very definite sequence and they stuck to this sequence regardless of hell or high water. By following the same routine everytime they **never missed a thing** and the final result was the same. All units were checked—no hit and miss proposition for them—because they know how easy it is to forget one or two units that way.

Gathering up all the different methods of doing tune-up jobs we unscrambled them into what we think is the easiest and most simple method. We've laid out our eggs here and if you'll look closely you'll find that it will prevent back-tracking. Having to check certain units twice is no fun. Whether or not you follow the method of tune up as we show it—get yourself into the habit of following a definite sequence everytime you do a tune up job.

11 CARBURETOR

The carburetor doesn't always have to be removed. Road tests usually show up defects in high speed operation. Low speed checking and adjusting can be carried out with the help of a vacuum gauge. Checking the carburetor doesn't mean installing a complete kit of parts. Remember—dirt, gum and faulty adjustments are the worst offenders to carburetors.

Cam Vol. 1 page 52 - 81 - 101 - 161

12 MISCELLANEOUS

No tune-up can be called complete without checking the following all-important items and doing any replacing, cleaning or adjusting necessary.
Air cleaners—crankcase ventilators—oil filters—radiator—radiator hose—manifold and cylinder head studs—manifold heat valves—engine temperature—windshield wiper—horn—lights and instruments on dash. Final ignition timing should be done on the road under operating conditions.

Cam Vol. 1 pages 132-143-36-114-51-66
Vol. 2 page 18-46

THEM FIT AS A FIDDLE!

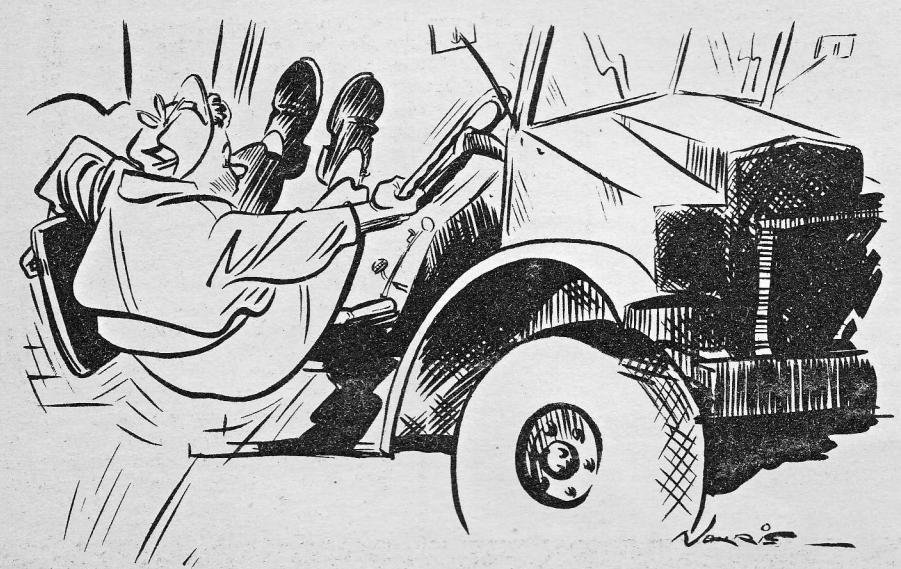
For B.F.s

The Outdoor Man . . . . .

IT'S remarkable how many B.F's. there are in this man's (and woman's) army that are both athletic and tired at the same time. The popular sport known as "Swinging on a door" or "Hold your horsepower till I get on" seems to be the rage (much to the despair of the men in the body shops).

Perhaps you still don't know what we're driving at, so just stop in your syllables a moment and try to remember exactly how **you** climb into a D.N.D. vehicle. The popular method among B.F's. is to toss one foot on the running board. At the same time they grasp the door at about the spot where your elbow rests when you take a nap in the cab. Second, with the dexterity of a stumblebum they do a one hand pushup (they'd call the corporal all kinds of things if he ordered them to do it) using the door to take the weight of their torso. About this time the other hand shoots out and grasps anything which seems handy. From that position the body can be swung through the intervening space to the seat.

What happens to the door hinge is merely incidental—that is until the door is closed. Then it is discovered that for some strange reason the door won't shut tight. The conclusion to this little episode takes place in the body shop. Unfortunately the language used by the body repair men isn't quite the type we like to print even though it may be educational. Let it be sufficient to say that the unnecessary straightening and welding he has to do on door hinges is a crying shame.



". . . the body can be swung through the intervening space."

". . . until you lie down on it."

One of these days maybe you'll bump into one of these door smashing demons. When you do, point out to him with any blunt instrument that's handy, how to get into a vehicle without using the door to hoist himself up.

A close relative of this B.F. (the family springs from a long line of flagpole sitters) will turn up in the spring, but we might as well mention him now. He thinks only one of the windshield support brackets should be used—the other being just the manufacturer's way of using up surplus brackets. Tilting the windshield outward then, this B.F. tightens one clamp only—which gives support to the windshield on one side. Nothing wrong with that, of course, until the vehicle is set in motion. Cut one leg off your bed and you'd have just as solid a proposition (until you lay down on it).

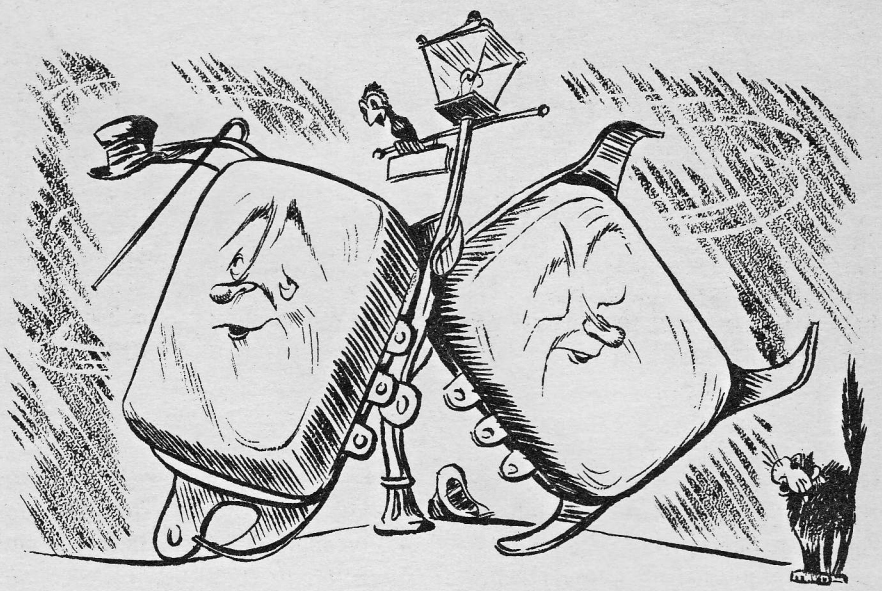
You'd think the ultimate result could be plainly seen. When the vehicle is in motion the frame of the windshield (being supported on one side only) tends to distort and buckle. The glass, not being the type that bends readily, usually cracks before very long — thus another headache for the body shop. Such an utter waste of time and material!

Perhaps a suitable reward for these bad habits would be to make the fellow who caused the damage do the repairs himself, standing on one leg.

x y z

WHY REGULATORS GO WRONG

Not that they're bad at heart, but regulators are often led astray by bad connections in other parts of the generator circuit.



EVERYONE (with an 'M' score above 7⅛) knows that high output generators on army vehicles won't percolate as they should if the regulator is on the fritz. The burning question is—why do regulator points give a lot of grief on some vehicles? Thereby hangs a tale of P.M. (and it's a dirty one, Ed.). You see, it's like this: the generator regulator depends on clean, tight connections right from one end of the charging circuit to the other. Maybe your wondering how come, maybe you think we're pulling your leg—so let us elucidate.

Underneath the cover of the regulator are three separate units: the cut-out relay, the current regulator, and the voltage regulator. Each one has an important job to do. The voltage regulator, for instance, protects the electrical system on the vehicle from high voltage—that is, if it's doing it's job as it should.

Now, here's an interesting point about generators. Why does the generator voltage ever have to go above six volts? Of course, if you're a wise old owl where electricity is concerned, that may sound like a silly question. In fact, if you've ever pumped up a tire you'll know the reason. If a tire requires a pressure of 30 pounds and there's already 20 pounds pressure in it, the pump would have to be capable of exerting more than 30 pounds pressure to handle the job. It would have to overcome the pressure already in the tire plus any restriction in the lines and valve. But let's get back to the electrical system.

The generator equals the voltage of the battery plus the voltage in the

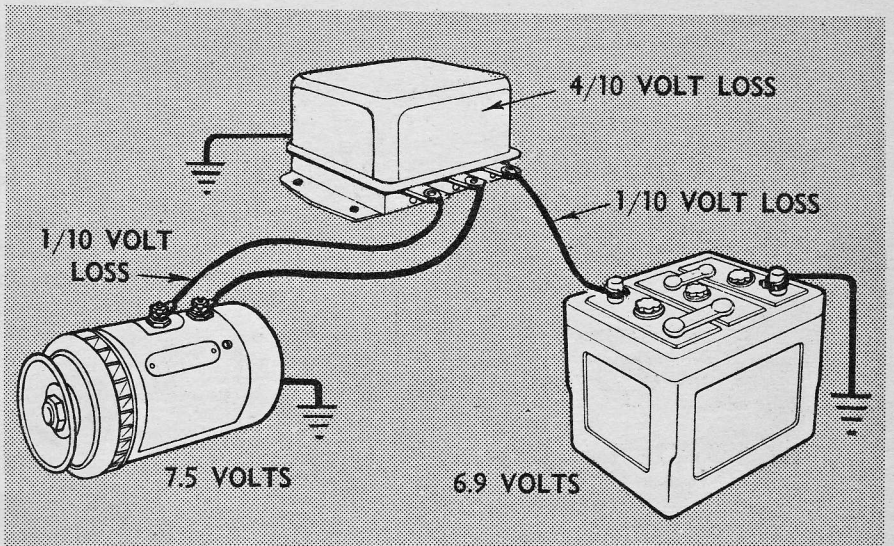


Fig. 1. The generator must overcome the battery voltage plus any resistance in the wires and connections. The more resistance the higher the generator voltage.

That's how the generator can burn out even though the regulator is operating properly.

In another job you might run across resistance between the regulator and battery, or inside the battery. (Sulphated battery). In this case the generator voltage would build up to overcome the resistance but the regulator, being on its toes, would operate like a jitterbug with St. Vitus' dance. This might prevent the voltage from going high enough to overcome the resistance. Result —the battery wouldn't be charged. It would also mean the voltage regulator would be operating all the time —and that's why you run into a lot of regulator point trouble on some vehicles. So here's the point—the voltage regulator should only have to operate when the battery voltage gets too high It shouldn't work overtime due to resistance in the circuit.

To prevent this revolt in the charging system you do a little preventive maintenance **before** trouble develops. You check the circuit for resistance with a voltmeter. How? Simple as falling off a log-book.

With the generator charging the battery at 20 amps you plunk one test prod on the armature terminal of the generator. The other test prod goes on the insulated battery post. (See Fig. 4). You'll always get a little reading because there's always some voltage loss in the circuit due to the natural resistance of the wires. With a 20 amp **charging rate** you should never find more than **¾ volt loss.**

If the voltage regulator points are operating you may not be able to obtain a 20 amp charging rate—that's why you'll likely have to short out the regulator. On Ford and Willys you do this by connecting a jumper wire between the **field** and **armature** terminal. On G.M.C. and Chrysler products connect the jumper between the field terminal and **ground.** Then set the throttle to give you a 20 amp charging rate.

Connecting the test voltmeter as in Fig. 4 is like a detour on a highway. The greater the obstruction in a highway, the greater will be the traffic through the detour. When checking the generator circuit, the voltmeter is the detour—the more restriction to current flow in the main line, the higher reading you'll get on your meter. Like we said, you should never find more than ¾ volt loss. But if you do—don't let it give you a pain in the bustle. A little more prodding in the right places and the exact spot of resistance will pop out in front of your eyes.

Leave one voltmeter lead connected to the insulated battery post. With the other voltmeter lead you start your **systematic** prodding. Touch each connection as shown in Fig 5. As you progress through the circuit, the readings on your test meter will add up. When you pass that part of the circuit having the excessive resistance your test meter will take a big jump. For example—if your meter reads 2/10 between A and B, then jumps to 1 volt between A and C, you'd know right off that you've got 8/10 loss in the regulator. In this case you'd install another regulator and let the boys in the electrical shop worry about the old one. Sometimes you'll find excessive voltage loss between A and B. This might be caused by poor connections, or it might be excessive internal resistance in the dash ammeter. You can pin this voltage loss down to the

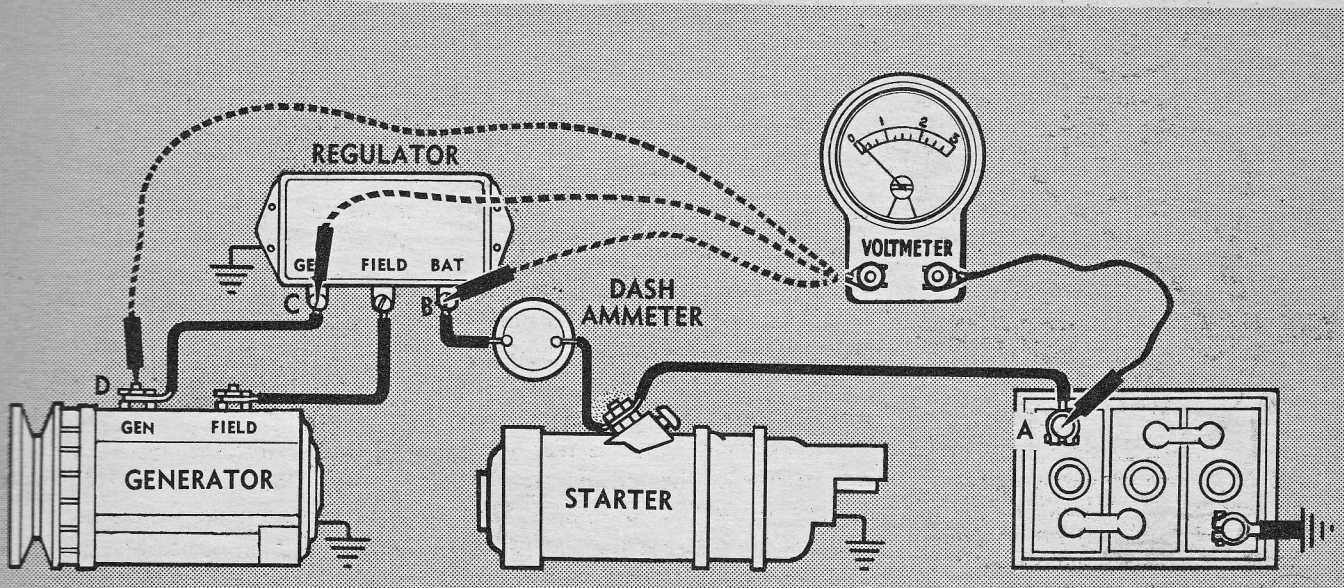


Fig. 5. Here's how you find which part of the circuit has the most resistance. If you get more than ¾ volt between A and B you've got to locate and eliminate some of it.

exact spot by bridging each separate part of the circuit with your voltmeter. Fig. 6 shows how resistance is spotted between a terminal post and its connecting wire. The same routine is used for measuring voltage drop in any part of the vehicle's electrical system.

Often poor connections in the grounded part of the circuit will cause trouble. They are usually overlooked, because you wouldn't expect to find a poor connection between the generator and the frame of the vehicle, or a poorly grounded regulator. Checking these connections, then, should be included in your P.M. It only takes a moment, and who knows—you might save a generator from burning up. Check the field wire between the generator as well. Use the same tactics as you would to find resistance in any other part of the electrical system. Just make like a detour with your voltmeter while the generator is charging. **Any voltage reading** in the ground circuit is **too much.**

Try these tests and you'll have the drop on all kinds of charging circuit troubles. Your regulators will lead a clean life, for a change, too.

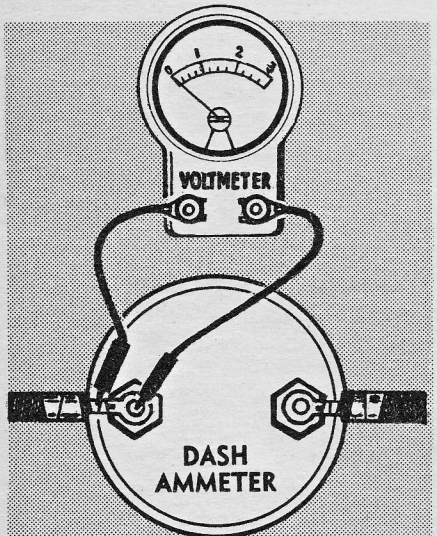
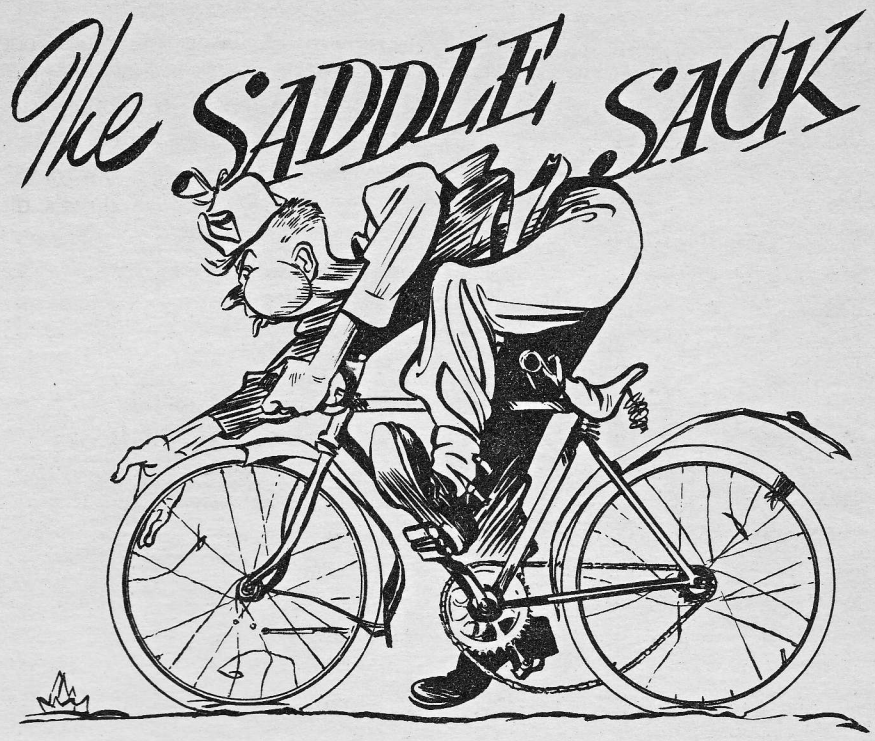


Fig. 6. A good connection gives no reading (no voltage drop). If you get a reading you've got bad connections—and we don't mean the company you keep.



The British call them "Push Cycles"
"and I see why" says Arm/Sgt. Dement T. Rowdy our S.A. Columnist

LAST week I used an Army bicycle. At the time I am in a hurry and think to save quite a large chunk of the nation's time by using the smart two tone khaki and red velocipede provided for such emergencies.

I soon found that time was to be one of my minor worries.

I start out, gaily singing Beethovens' fifth in B flat minor— (as is my wont when happy) and before I get to the first arpeggio I am consumed in a blind rage. The chain slips off the sprocket every third revolution of the rear wheel; the front wheel's cones are so loose, it uses the forks for guides; the rear cones are tighter'n the paymaster; the fenders rattle like a L/Cpls' head and the handlebars rise and fall at every stroke like the old village pump. To add to my pleasure, both tires have a slow leak and I am left at the halfway point of my journey with about 35 pounds of bicycle to carry.

Being vexed no end, I bestir myself upon my laboured return, to examine all available bicycles to find out if they are in the same condition.

They are.

Indignantly, I barge over to the armourer's shop and, standing with my left boot on the neck of the armourer, I say as follows: "Kizel! Why are all the bicycles in this place in such horrible shape?"

"Why, bless your heart," says Kizel, "every hang-dog in this place thinks he is a master mechanic, and when the bike won't run, they get a hammer, blunt screwdriver and three nails and go to work and make their own repairs. I never see the machines until a major rebuilding job is required."

I ponder this statement, and also the fact that there are plenty of units lacking even the tender ministrations of an armourer—a matter which I bring to Cpl. Kizel's attten-

(Continued on page 79)

Sgt. O'Sweat's— HEADACHE & ASPIRIN Dept.

The time has come when you should meet,
A guy who's strictly on the beat.
Advice he gives to generals free,
Even takes the Padre on his knee.
With a blood hound's nose and air-cooled brain,
There is no answer he can't obtain.
So if you've a problem you can't solve,
On women — maintenance — why wheels won't revolve
Just drop a line to the gent above,
O'Sweat's the name—you know—care of

Cam Magazine, Directorate of Mechanical Engineering, Dept. of National Defence, Ottawa.

Dear Sgt. O'Sweat:

How in hell do you make the caster and camber adjustment on 15 cwts? I've got one in the shop now that's out of adjustment and as I can't find any way of correcting it outside of installing tapered shims (which I can't get) I'll hold it for a few days hoping to get an answer from you by mail.

Sgt. B.J.

Dear Sgt. B.J:

Maybe the answer to the Sarg's question will be interesting to some of you other caster and camber artists so here's the dope.

There's no caster and camber adjustment on any of your G.M. 4 x 4's or 6 x 6's (that's why the Sarge couldn't find it). The only adjusticating you can do on these babies as far as steering geometry goes is the toe in.

You can't change the camber or caster by putting in shims (even if you make your own) because it's just not the thing to do.

If you ever find a G.M. 4 x 4 or 6 x 6 that needs camber or caster first aid—instead of looking for adjustments—look for something warped or bent. Most likely you'll find the same thing as the Sarge did—the axle housing or front axle twisted. About the only thing that will cause this twisting is meeting a Ram Tank or some such hard object head on.

O'Sweat

Dear O'Sweat:

Have you any suggestion on what can be done to prevent Ford carburetor and fuel pump bodies from being ruined. As you know it's very easy to strip the threads in these soft castings when installing the fuel lines. Once the threads are stripped the body has to be thrown in the scrap heap.

Sgt. D.L.

Dear Sgt D.L:

You sure said a tankful. I'm using a couple of those busted up castings for paper weights right now.

If there were enough Sergeants to go around every man could have one to coo in his ear whenever he connected a fuel line, "Take it easy chum, don't cross up the threads."

Another solution to prevent this double cross is to start the fuel line connection **before** the fuel pump or carburetor is bolted down. When the flanges of these units are not cinched down, you'll find there's enough movement to line up the connection perfectly and start the fitting with your fingers. You'll find you can't go wrong if you keep your wrench away from it till after you get the threads well started.

Try it and see for yourself.

O'Sweat

Dear O'Sweat:

I've been reading the article in CAM about distributors and found it very interesting. There's one question I would like to ask.

Why is it that one set of points in the Ford distributor always burn faster than the other set. And is there anything that can be done to make the points last longer?

Cpl. D.R.B.

Dear Cpl. D.R.B:

One of these fine days we'll get around to covering the complete story of Ford distributors. In the meantime I'll try to answer your question.

Arcing of the points is the cause of pitting and burning. The points in any distributor will arc slightly when they separate. The reason they arc is because the voltage in the primary winding of the coil builds up to around 350 volts. When the points open then, the high tension spark occurs at the spark plug and

at the same time the 350 volts pressure built up in the primary winding tries to keep the current flowing through the distributor points. You probably know that the condenser absorbs most of this—but there's nearly always a slight arcing as the points open.

The Ford distributor has two sets of contact points—one set closes the circuit and the other set opens the circuit. In other words it's an overlap system—like a two man relay race. When the first man stops running, the second man carries the peg and the race is uninterrupted. When the second man completes his part the race is over. Well (like I said) the Ford distributor operates in the same way. When the first set of contacts open, the circuit isn't broken because the second set is there to carry the current. But when the second set of contact opens, the high tension spark occurs and there's a slight arcing at the second pair of points only.

The only way you can make the contacts last longer is to be very careful when you install new points. Adjust the contact spring tension (20 to 24 ounces) the same for each contact. Adjust the cam-angle (contact spacing) exactly and put a thin film of grease (D.N.D. 665) on the cam lobes.

O'Sweat

Dear O'Sweat:

In most of the manuals the horse power of the various engines are shown as brake horse power and S.A.E. horsepower.

Can you explain the difference between these two terms?

Pte. J.C.L.

Dear Pte. J.C.L.:

I'd need about ten pages to give you all the low down (if I had it) on horsepower ratings—being short of space I'll try to nutshell it to fit.

The S.A.E. H.P. rating is based on a simple formula that was originally designed to give the approximate H.P. of an engine when 1000 ft. per min. piston speed was the accepted standard. It doesn't tell you much nowadays, as engine design has developed far beyond these old standards. It may come in handy for certain legal and licensing matters, but that's about all.

The **actual** useful H.P. is measured better by Brake Horsepower—that's the one you and I are interested in. The B.H.P. is the power available at the flywheel to drive the vehicle. It's called Brake Horsepower because it's measured by a braking device—called a Prony Brake or a Hydraulic or Electric Dynamometer. These testing devices, by means of friction or resistance, absorb the power of the engine and measure it—thus can rate an engine at varying speeds and accurately measure the amount of work it can do at different speeds.

Got any other ideas?

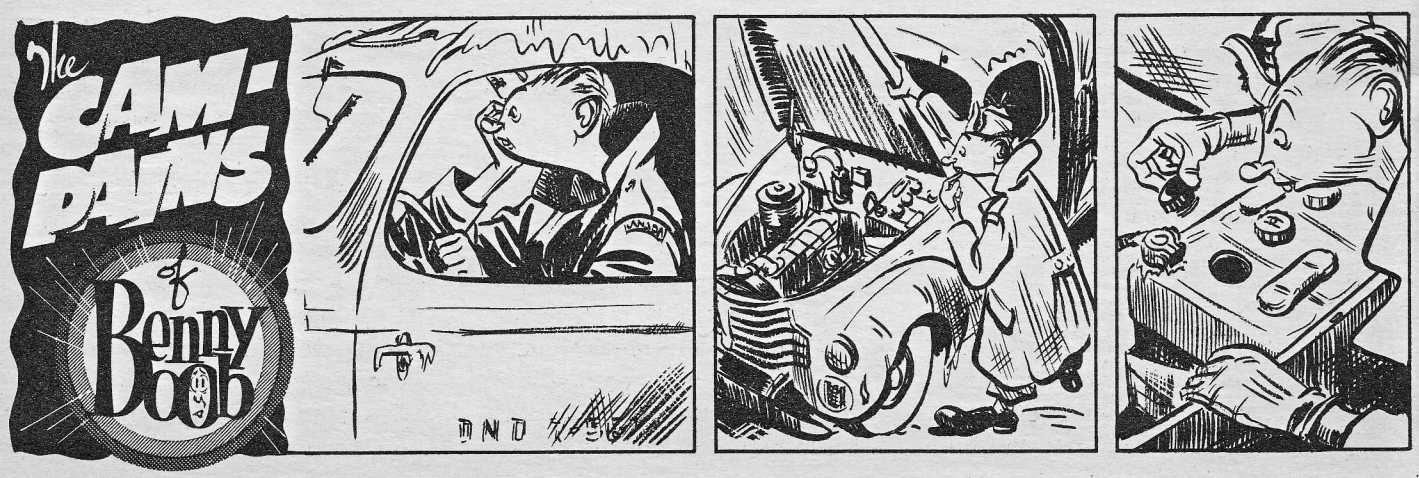
We mean ideas or wrinkles and short cuts to make maintenance of vehicles and equipment easier. Don't let ideas like this gather penicillin! Tell 'em to the khaki world by telling 'em to CAM, Directorate of Mechanical Engineering, Dept. of National Defence, Ottawa.

There's another rating—Indicated Horsepower, which is the power developed by the combustion in the cylinder and doesn't include frictional losses of the moving parts. This rating is used mainly by engine designers.

To sum up the story: The S.A.E. rating means little as far as the actual horsepower of the engine is concerned. The I.H.P. is the actual power developed in the combustion chamber and the B.H.P. is what is left of the I.H.P. after we deduct the friction losses inside the engine.

If, by any chance, you'd like more information on horsepower or the formulas to figure it out, I'll be glad to send it to you for the asking.

O'Sweat



BICYCLES (continued from page 76)

tion—who replied, "Tell them that there are a few simple solutions to the problem of bike care—one is a strong acid one for dunking these sag-saddle characters in, the others are more practical, what with the manpower shortage. Proper tire pressures should be 30-35 lbs.—depending upon the weight of the rider. Seeing the valve caps are in place will add to the air's security. Fixing flats is a simple cold patch job on bikes—except that brute force methods of replacing the tire can bust the comparatively light bead wire. Seeing that the bead is well down in the opposite well of the rim, makes the job simple and saves much rubber, sweat and swearing."

"Chains are the next most prolific trouble breeders. Some guys don't seem to mind riding along, steering with the left hand while guiding the chain over the sprockets with the right fingers. An acute shortage of fingers sometimes ends this procedure. However a simple matter of adjusting the chain so that it has ½" up and down play in the centre (after revolving the chain to its tightest spot)—has definite advantages."

"This adjustment must be checked everytime the rear wheel is moved or taken off and should be checked periodically, because chains "stretch" due to wear in each link."

"Wheel bearings are always in trouble. Often, they're adjusted too tight and the races and balls are ruined in short order, while the rider gets the impression that he's going up a 70% grade all the time. Too loose adjustment steps up wear and the entrance of dirt and water helps in this direction. They should be adjusted so that the wheel turns freely enough for the valve stem to always come to rest at the bottom when the wheel is spun—with hardly any preceptible 'shake' at the rim."

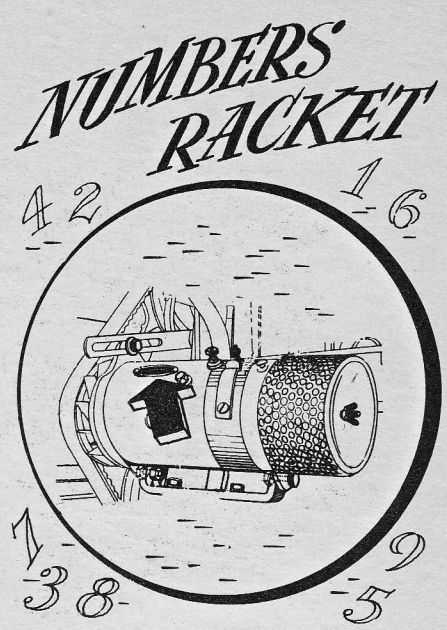
"Lube is a simple business. A few drops of light oil every week in each oil hole and on the chain (wipe off the excess oil from the outside of the chain) does the trick. The steering-head bearings are packed by the armourer with D.N.D. 665."

"And that" says Kizel, "is about the sum total of the rider's maintenance. Anything beyond that—like frame straightening or wheel spoking, is the armourer's worry—let him have it."

As Kizel is running out of breath I took the moment as opportune to make my escape, which I do, pondering the fact that, in the average outfit, what happens to a bike shouldn't happen to a tike.

Now being a time of year when the battered remains are being picked over, patched up and prepared for another season of being pushed around, maybe Kizel's tirade will suggest a new and happier approach to the numble wheel.

x y z



WE'RE speaking of the numbers stamped on the generator identification plate on some of your 1942 G.M.C. trucks. We're also thinking of the racket your liable to make if you find the number stamped on this plate turns out to be a starter model number.

Word just received from the factory tells us a few of these 1942 jobs reached the field with starter identification plates on the generators instead of the proper generator model. Might be a bother trying to locate the correct parts—much less trying to make a starter armature work in a generator.

To avoid this bother at a later date better check all your G.Ms right now. If the number stamped on the plate is 1107009 obliterate it and stamp the correct number 1102695 above it.

Hoot Mon arch to what you're told and don't get Exided. You didn't Auto-lite matches to check batteries. Bless your little Hart–Delco up in your face everytime, which Willardly add to your beauty – or the battery's.

ASSEMBLY RACK

WE can remember way back when we took the family cuckoo clock apart and old Uncle Fudd cracked the one about us having enough parts left over to fix him up with a reliable wrist watch. That was when we reached out of our crib and beat his ears off with our lolly-pop.

Now we're sorry—after seeing these pictures of component racks that are in use at General Motors, maybe Uncle had something. Maybe parts **do** get lost, misplaced or damaged during a complete disassembly. In fact we've made up our mind that there's a dern good chance of it—unless they're blessed with the aid of such a rack as this.

With the bits and pieces neatly stacked on one of these racks there's no need for that conglomeration of jam-tins, soap-boxes and Kleenex cartons scattered around the scene. A close look at the fore and aft views shown here will disclose a couple of smart ideas on how this mechanical valet works. Note the various small detachable trays holding piston assemblies, valves, tappets, etc., that fit onto the main rack. Note too, the castors—for spotting the collection where it's handy to the job.

Although this sample happens to be a super-deluxe effort in steel—tailor made for Chev engine parts—there's no reason why wood, of suitable weight and strength, could not be substituted, and the rack adapted to handle any other make of vehicle.

x y z

TURRET LOCKS

SPEAKING of benders—we've heard of a few cases where tanks have been operated with the turret unlocked. What a mess that long steel barrel can make as it tangles with passing vehicles, trees, poles, and whatever the nearby countryside has to offer!

Unfortunately, all the damage isn't confined to the surrounding terrain. After all—the gun barrel wasn't designed to use like a baseball bat and it doesn't take much of a bump on its snout to make it shoot around corners.

Not all damage of this nature takes place when the tank is being operated, either. In one case we heard of, the turret on a tank being shipped by flat car swung around and derailed several cars of a passing freight. When shipping one by rail take extra precautions. Make sure the turret travelling lock is seated securely in the ring. And besides that, lash the turret well.

If you have a turret lock that's broken or won't stay locked, it's better to ground the tank than attempt to operate it with the gun tied down with ropes or chains. A new and better lock, referred to in Modification Bulletin B25 and C.A.L.E.M.E.I. Tracked Vehicles J257, Instruction 5, should be installed.

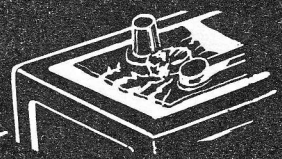
A turret on the loose can produce more havoc than a bull in a china shop. Lock it up for safekeeping.

REFORM SCHOOL PRIMER

on how to be cell-happy

THIS IS A BATTERY TERMINAL PULLER-

THIS IS WHAT HAPPENS WHEN A SCREWDRIVER IS USED TO PRY OFF BATTERY TERMINALS-



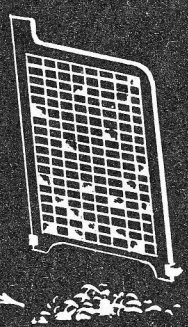
THIS IS BAKING SODA FOR CLEANING CABLE TERMINALS.

THIS IS A WIRE BRUSH WHICH SCRATCHES THE COATING OFF CABLE TERMINALS, ALLOWING CORROSION.

THIS IS WHAT HAPPENS WHEN BATTERY PLIERS ARE USED TO CLEAN BATTERY POSTS-

THIS IS A TERMINAL REAMER AND SPREADER.

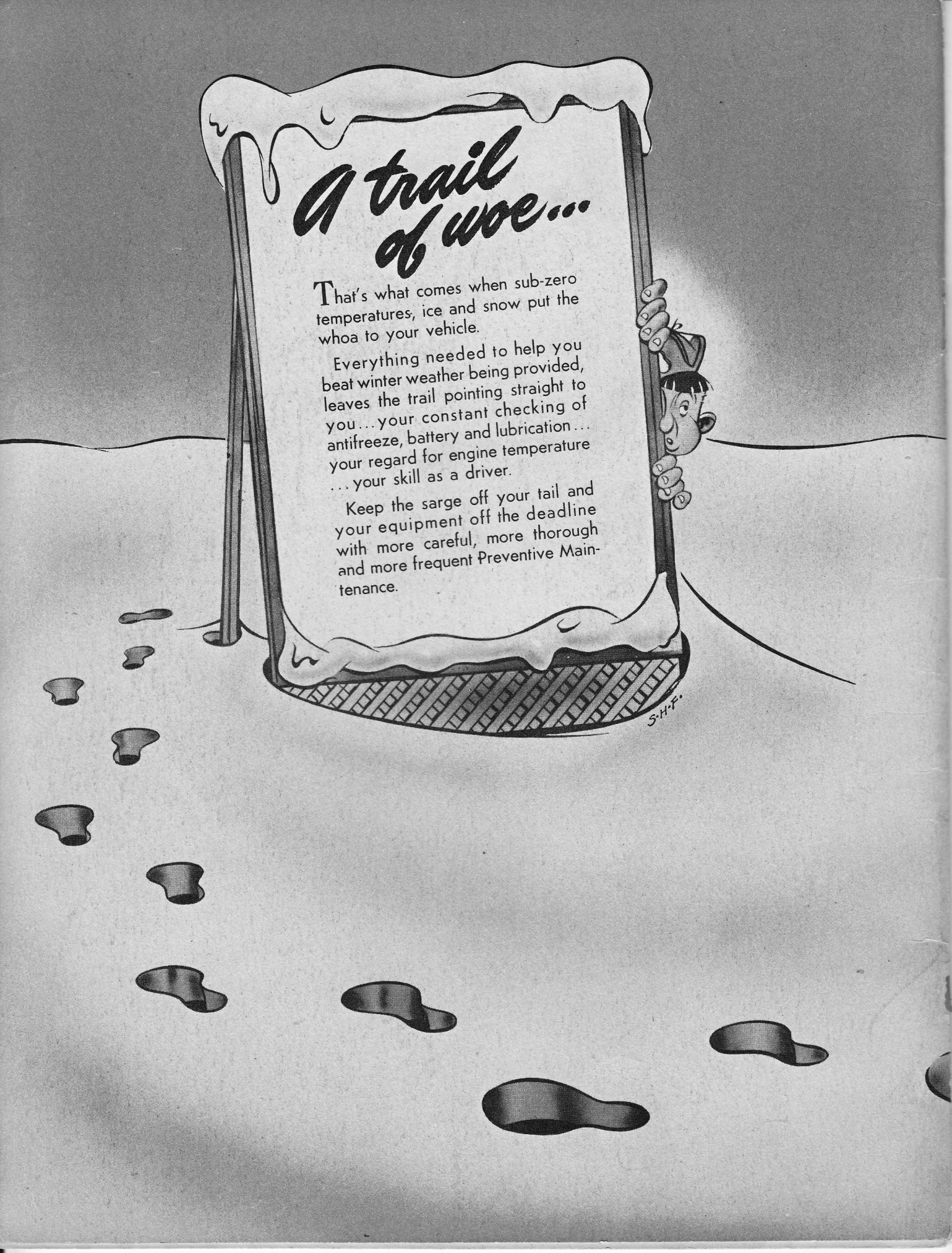
THIS IS WHAT HAPPENS WHEN A HAMMER IS USED TO PUT ON TERMINALS INSTEAD OF SPREADING THEM FIRST WITH A SPREADER.



THIS IS A SGT. WHO SAW A JOE INSTALLING A BATTERY WITHOUT THE PROPER BATTERY TOOLS, WHICH ARE IN EVERY WORK-SHOP AND UNIT GARAGE.

teacher

BEN DOB-


A trail of woe...
That's what comes when sub-zero temperatures, ice and snow put the whoa to your vehicle.
Everything needed to help you beat winter weather being provided, leaves the trail pointing straight to you... your constant checking of antifreeze, battery and lubrication... your regard for engine temperature ... your skill as a driver.
Keep the sarge off your tail and your equipment off the deadline with more careful, more thorough and more frequent Preventive Maintenance.
S·H·F·